(d) The free surface effect is to be calculated:

(1) at an angle of heel of 5 degrees for each individual compartment; or

(2) by assessing the shift of liquids by moment of transference calculations.

(e) In calculating the effect of free surfaces of consumable liquids, it is to be assumed that, for each type of liquid, at least one transverse pair or a single centerline tank has a free surface and the tank or combination of tanks to be taken into account is to be those where the effect of free surface is the greatest.

[CGD 74–32, 40 FR 48283, Oct. 14, 1975, as amended by USCG–2000–7641, 66 FR 55573, Nov. 2, 2001; USCG–2008–0179, 73 FR 35015, June 19, 2008]

APPENDIX C TO PART 157—PROCEDURE FOR DETERMINING DISTRIBUTION OF SEGREGATED BALLAST TANKS TO PROVIDE PROTECTION AGAINST OIL OUTFLOW IN THE EVENT OF GROUNDING, RAMMING, OR COLLISION

1. *Source.* The procedure for determining the distribution of segregated ballast tanks contained in this appendix conforms to Regulation 18, paragraphs 12–15 of the MARPOL Protocol.

2. *Procedure.* Protective location of segregated ballast tanks, voids, and other spaces that do not carry cargo which are within the cargo tank length is determined from the following:

$\Sigma\,PA_c + \Sigma\,PA_s = J[L_t(B+2D)]$

Where:

PA_c=the side shell area in square meters based on projected molded dimensions for each segregated ballast tank, void, or other space that does not carry cargo and which complies with paragraph 2(b) of this appendix;

PA_s=the bottom shell area in square meters based on projected molded dimensions for each segregated ballast tank, void, or other space that does not carry cargo and which complies with paragraph 2(b) of this appendix;

L_t=the length in meters between the forward and after extremities of the cargo tanks;

B=the maximum breadth of the ship in meters measured amidship to the molded line of the frame; and

D=the molded depth in meters measured vertically from the top of the keel plate to the top of the freeboard deck beam at the side amidships. In tank vessels having rounded gunwales, the molded depth is measured from the top of the keel plate to the point of intersection of the molded lines of the deck and side shell plating, the lines being extended as though the gunwale were of angular design.

(a) *Method of determining a value for J.*

(1) For tank vessels for 20,000 DWT, J=0.45.

(2) For tank vessels of 200,000 DWT or more:

(i) J=0.30; or

(ii) J=the greater of 0.20, or

$$0.30 - \left[a - \frac{(O_c + O_s)}{40_A} \right] \; ,$$

where:

a=0.25 for tank vessels of 200,000 DWT.

a=0.40 for tank vessels of 300,000 DWT.

a=0.50 for tank vessels of 420,000 DWT.

For values of DWT between 200,000 and 300,000 DWT, 300,000 and 420,000 DWT, and greater than 420,000 DWT, the value of ''a'' is determined by linear interpolation.

O_c = as calculated in Appendix A of this part.

O_s = as calculated in Appendix A of this part.

O_A = the allowable oil outflow meeting §157.19(b)(1) of this part.

(3) For values of DWT between 20,000 and 200,000 DWT, the value of ''J'' is determined by linear interpolation between 0.45 and 0.30 respectively.

(b) PA_c and PA_s: *Criteria for determining the segregated ballast tanks, voids, and other spaces that do not carry cargo.*

The following criteria are to be met for a segregated ballast tank, void, or space that does not carry cargo, to be used in determining PA_c and PA_s:

(1) The minimum width of each wing tank or space, either of which extends for the full depth of the vessel's side or from the main deck to the top of the double bottoms is 2 meters or more. The width is measured inboard from the vessel's side shell plating at right angles to the vessel's center line. If a wing tank or space has a width anywhere within it that is less than 2 meters, that wing tank or space is not used when calculating PA_c.

(2) The minimum vertical depth of each double bottom tank or space is B/15 or 2 meters, whichever is smaller. If a double bottom tank or space has a depth less than B/15 or 2 meters, whichever is smaller, anywhere within it, the double bottom or space is not to be used when calculating PA_s.

(3) The minimum width of a wing tank or space is not measured in the way of—

(i) the turn of the bilge area; or

(ii) a rounded gunwale area.

(4) The minimum depth of a double bottom tank or space is not measured in the way of the turn of the bilge area.

[CGD 77–058b, 45 FR 43716, June 30, 1980, as amended by USCG–2008–0179, 73 FR 35015, June 19, 2008]